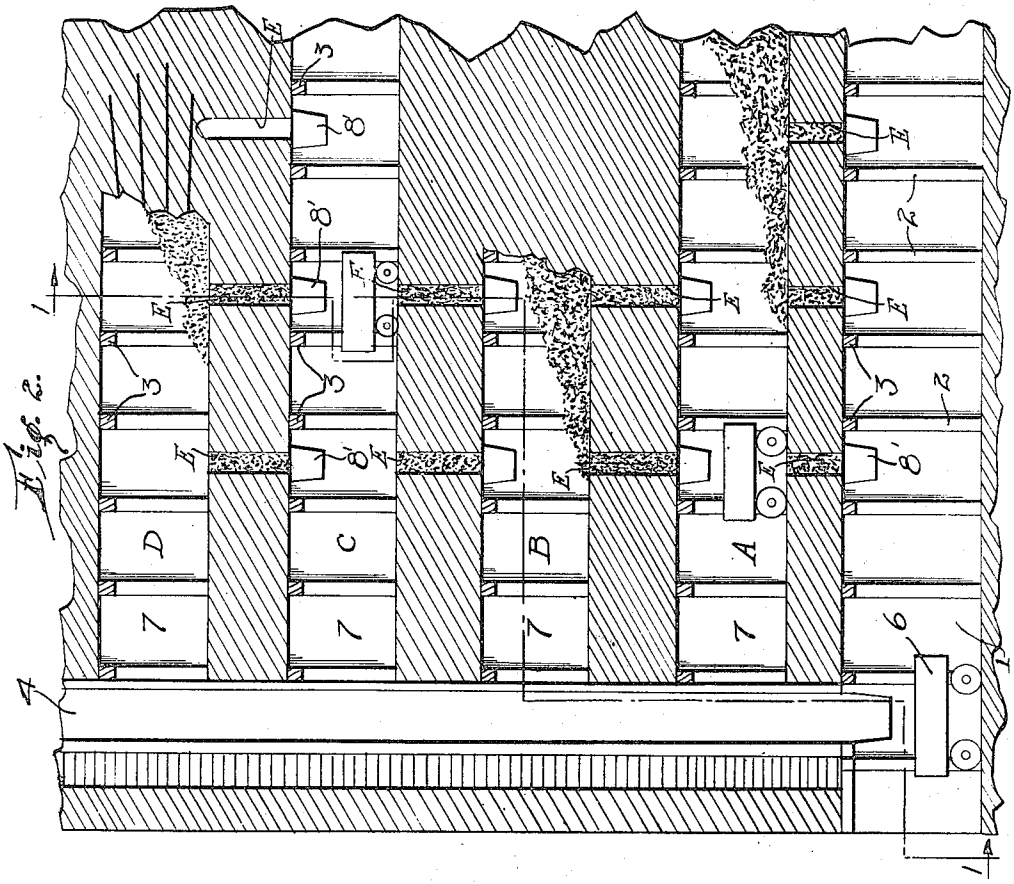
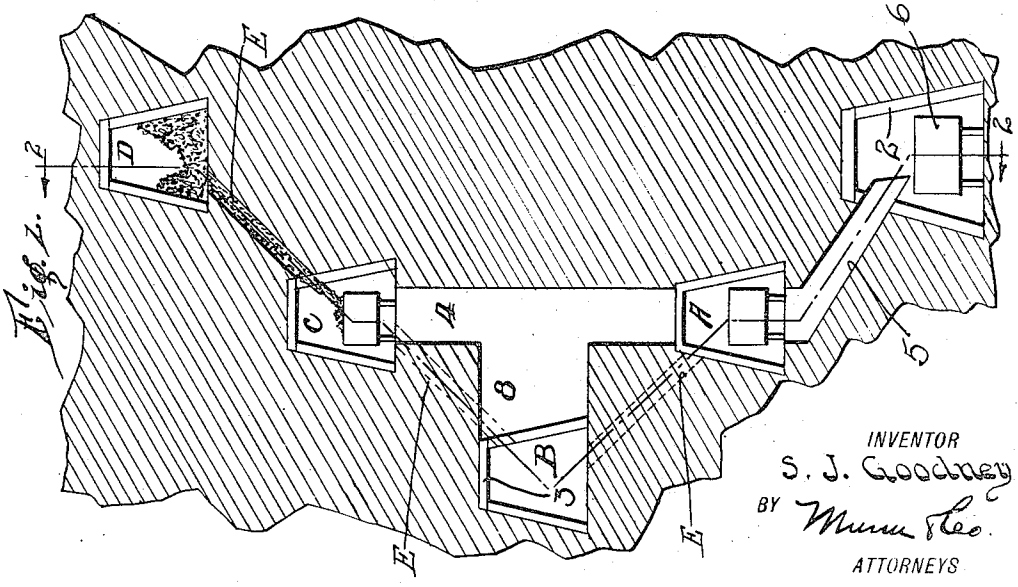
July 22, 1924. 1,502,030

S. J. GOODNEY

PROCESS OF MINING SOFT ORE

Filed July 1, 1922. 2 Sheets-Sheet 1





INVENTOR
S. J. Goodney
BY Munn & Co.
ATTORNEYS

July 22, 1924. 1,502,030

S. J. GOODNEY

PROCESS OF MINING SOFT ORE

Filed July 1, 1922 2 Sheets-Sheet 2

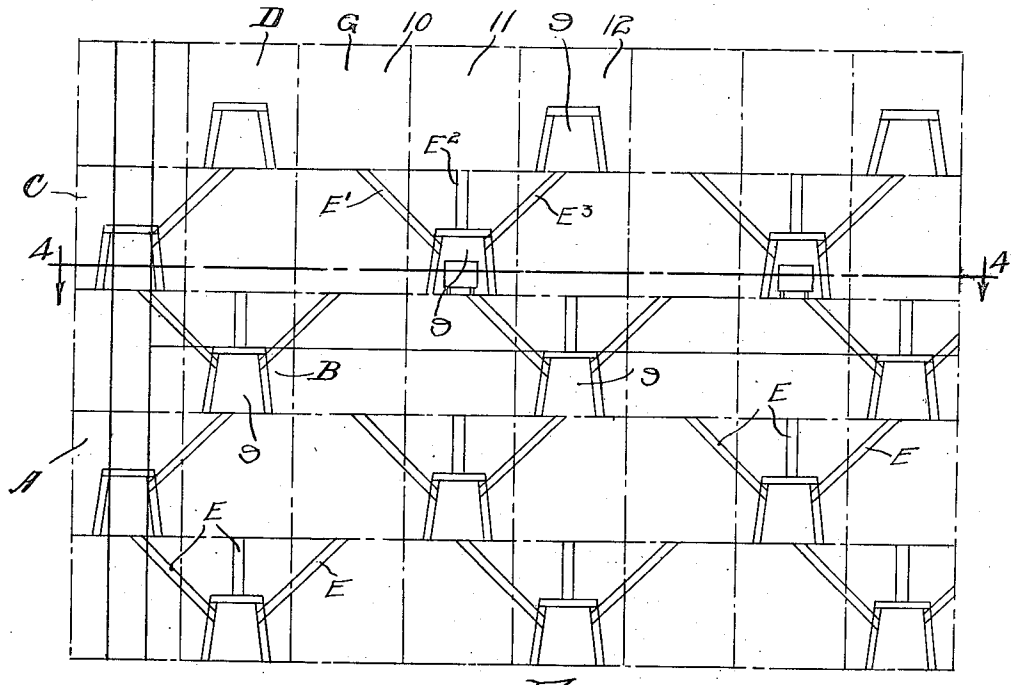


Fig. 3.

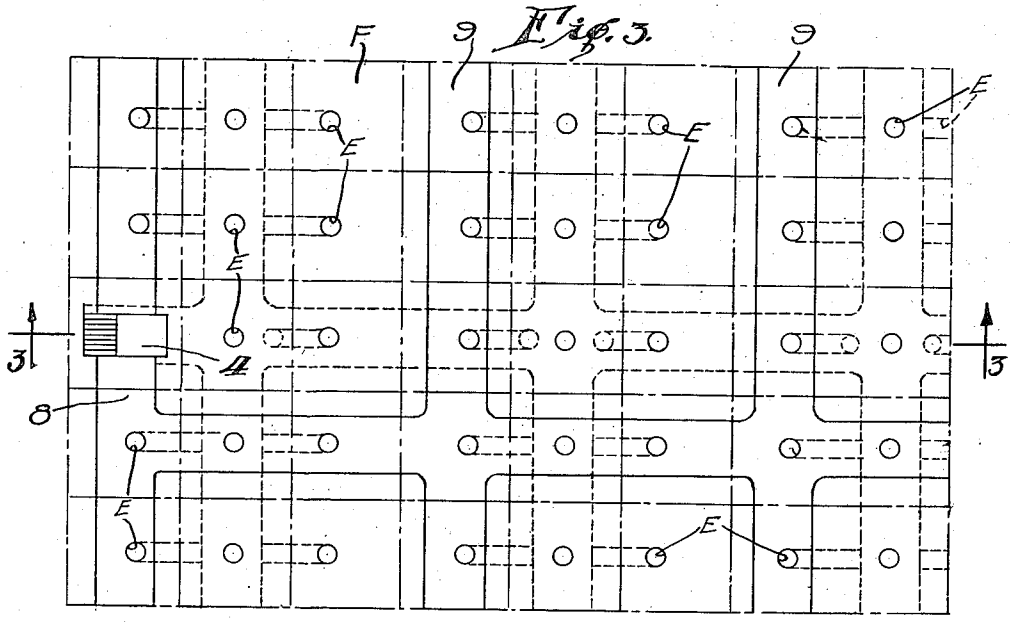


Fig. 4.

INVENTOR
S. J. Goodney
BY Munn & Co.
ATTORNEYS

Patented July 22, 1924. 1,502,030

UNITED STATES PATENT OFFICE.

SAMUEL JOHN GOODNEY, OF CRYSTAL FALLS, MICHIGAN.

PROCESS OF MINING SOFT ORE.

Application filed July 1, 1922. Serial No. 572,249.

To all whom it may concern:

Be it known that I, SAMUEL JOHN GOODNEY, a citizen of the United States, and a resident of Crystal Falls, in the county of Iron and State of Michigan, have invented a new and useful Improvement in Processes of Mining Soft Ore, of which the following is a full, clear, and exact description.

My invention relates to improvements in process of mining soft ore, and it consists in the steps hereinafter disclosed.

An object of my invention is to provide a process of mining soft ore which reduces the manual handling of the ore to a minimum.

A further object of my invention is to provide a process of mining ore in which a greater part of the ore is conveyed by gravity from one sub-level to the next, whereby the ore can be readily deposited at once in cars.

A further object of my invention is to provide a process of mining ore which is adapted to provide a continuous stream of ore from the mine.

A further object of my invention is to provide a process of mining ore in which all of the ore may be readily excavated from the mine.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which—

Figure 1 is a vertical section along the line 1—1 of Figure 2,

Figure 2 is a vertical section along the line 2—2 of Figure 1,

Figure 3 is a vertical section along the line 3—3 of Figure 4, and

Figure 4 is a horizontal section along the line 4—4 of Figure 3.

In the ordinary process of mining ore, a shaft is sunk down to the bottom of the level and a main cross-cut is extended along the lower portion of the vein from the main shaft. From this cross-cut main raises are extended vertically up into the vein and are usually disposed approximately 120 feet apart. Each of the main raises is divided into sub-levels which are substantially 12 feet apart, these sub-levels extending parallel with the main cross-cut and communicating with their respective raises. The ore in these sub-levels is mined and is shoveled into cars by the miners, the cars then being trammed to the main raise and being dumped so as to cause the ore in the car to be deposited in a car which is disposed at the bottom of the main raise. This car in turn conveys the ore to the shaft and is conveyed upwardly in the shaft to the ground level. In this process all of the ore which is mined has to be shoveled into cars, thereby requiring a considerable amount of labor and time.

In my present process, a great portion of the ore which is mined is automatically conveyed to the mine cars, thereby obviating a great amount of labor in mining ore, and furthermore, expediting the mining process. A shaft (not shown) is sunk to the bottom of the level, as is the case in the ordinary mining of ore, and a main cross-cut 1 is dug at right angles to the shaft, and preferably extends the entire length of the vein. This cross-cut is reenforced by uprights 2 and cross beams 3 which may be of the required strength to safely carry the load imposed thereon. From this cross-cut a plurality of main raises 4 are dug, these raises extending to the top of the ore and having a bend 5 adjacent to their lower ends. In the drawings I have shown only one of these main raises which communicates with the main cross-cut 1, and in Figures 1 and 2 I have shown how the main raise communicates with the main cross-cut 1. The reason for bending the main raise adjacent to the lower end thereof is to break the fall or momentum of the ore before it is dumped into the mine car 6. The main raise is subdivided into a plurality of sub-levels 7, these sub-levels being indicated by letters A, B, C, and D. As clearly shown in Figure 1, the sub-levels A, B, C, and D are not vertically alined with respect to each other, but are zig-zag in the manner shown so as not to apply too great a strain on one portion of the ore, and to expedite mining as will be hereinafter described. Figure 4 shows a section through the sub-level D and it will be noted that this sub-level has a bend at right angles at 8 which communicates with the main raise 4.

The upper sub-levels, i. e., the sub-levels C and D are preferably opened first, if the ore is soft and heavy, although as a general course, all of the sub-levels A, B, C, and D are opened together, the bottom or lower

sub-levels being further advanced. Sub-raises E are dug from the ceiling of one sub-level and extend to the floor of the sub-level disposed thereabove (see Figures 1 and 3). These sub-raises are disposed every few feet apart and are opened by first drilling one or more holes and inserting a charge of dynamite, whereupon the blast of the dynamite and the burning of the ore will open the sub-raise E big enough so as to readily convey the ore from the upper sub-level to the lower sub-level. The lower ends of the sub-raises are provided with spouts 8′ which are removably secured thereto and which are adapted to convey the ore from the sub-raises into mine cars. It is obvious that a mine car is disposed beneath the sub-raise through which the ore is passing. In order to insure protection to the floor separating the sub-levels, the sub-raise which has been used is packed with ore so as to prevent the caving in of the walls of the sub-raise. In Figure 2 I have shown the various sub-levels as being dug to different depths in the vein. The principal object of providing sub-raises which connect the various sub-levels together lies in the fact that two-thirds of the ore mined, flows through the sub-raise and is adapted to be loaded into the mine cars, thereby obviating the necessity of manually lifting the ore into the car. As heretofore stated, this construction not only lessens the number of miners needed in mining ore, but also expedites the mining of the ore. A further advantage is derived from this process and lies in the fact that the ore is delivered in a continuous stream to the main shaft, whereas in the ordinary practice, this is not accomplished.

After the sub-levels have been extended to the end of the vein, or to their limits, all of the ore in the vein lying in the same plane as the sub-levels, is mined. In the present process, the ore in a plane parallel with the first sub-level is mined out first before the lower sub-levels are mined out. In identically the same manner as the sub-levels are opened simultaneously, each sub-level has sub cross drifts 9 opened simultaneously, the drifts extending at right angles to the main sub-levels. As clearly shown in Figure 3, the sub cross drifts 9 are not disposed vertically one above the other, but are zig-zag in much the same manner as the sub-levels A, B, C, and D are zig-zag. The vein is theoretically divided into a plurality of horizontal blocks F and vertical blocks G. It will be noted that the sub-drifts 9 are disposed in every third block and that sub-raises E extend upwardly from these sub-drifts to the three blocks disposed thereabove. For example, the middle sub-drift 9 communicating with the sub-level C is provided with three raises E^1, E^2, and E^3, these raises communicating with the blocks 10, 11, and 12. It will be noted that the sub-drift 9 of the sub-level D is disposed in the block 12 and that therefore a portion of the ore in the block 12 has already been mined. The sub-raises E^1, E^2, and E^3 are disposed at frequent intervals along the sub-drift 9 and communicate with the horizontal blocks F. As the ore in the blocks 10, 11, and 12 is mined, it will be conveyed through the sub-raises E^1, E^2, and E^3 respectively, from which sub-raises it may be readily guided into the mine car disposed in the sub-drift. It is obvious that the ore is mined at the furthest point in the sub-level D from the main raise 4 and that the ore is gradually worked or mined from the furthest point in the sub-level D to the main raise 4. Before the horizontal blocks F are mined, all of the sub-levels A, B, C, and D are provided with their respective sub-drifts, so as to be able to convey the ore from the drift above into the mine car. In this manner, the blocks in the sub-levels D can be mined while the sub-drifts in the lower sub-levels are being mined. In other words, the miners can be working at different levels in the vein and the ore will be conveyed to the various mine cars at the same time. After the mine cars are filled with the ore, they are trammed to the main raise and are dumped, whereupon the ore will fall into the cars 6, as heretofore stated, and will be trammed to the main shaft (not shown).

The principal feature of this process is to so position the sub-levels and sub-drifts that they will be connected with each other by the sub-raises E and thus convey a great portion of the mined ore into the mine car. As heretofore stated, this greatly reduces the amount of labor needed in mining the ore and also increases the amount of ore delivered by the mine. In case the "gob" is too heavy for the frame work in the sub-level D, the sub-level may be opened up in a smaller size, and after being dug to the end of the vein, be enlarged, the sub-raises E being adapted to convey the ore as the digging progresses in both directions. It is obvious that if the ore is hard, the supporting frame work will not be needed, except on the top sub-level so as to support the "gob".

In opening a mine with my improved process, the main shaft (not shown) is first sunk and the main cross-cut is dug. From this cross-cut a plurality of main raises are dug, these raises being in communication with sub-levels. All of the sub-levels can be mined at the same time if desired, and with the sub-raises E, provide a continuous flow of the ore to the mine cars. The sub-drifts are then dug and communicate with their respective sub-levels, these sub-drifts also being in communication with the sub-drifts disposed therebelow by the sub-raises.

After the sub-drifts are opened, all of the ore in the top sub-level is mined, a greater portion thereof being conveyed through the raises and into the mine cars. In like manner, the other sub-levels are mined until the whole vein of ore is exhausted. Only the ore in the sub-drifts which communicate with the sub-level A has to be shoveled into the mine car by hand. It is obvious that with this process, the same number of miners can mine a far greater amount of ore in a much less time than is possible with the ordinary method of mining.

It is obvious that the mine car positioned below the raise which is conveying the mined ore, cannot hold all of the ore mined from one blast. The spout 8′ of the raise has to be closed by a miner when a car is filled, and opened again when another car is brought into place. It is also obvious that all of the mined ore will not automatically drop through the raise, but that some of the ore will have to be shoveled to the raise. The raises make use of gravity in conveying the mined ore to the cars.

I claim:

1. The herein described steps in a process of mining soft ore which consists in sinking a shaft in the vein of ore, extending a cross-cut from the bottom of the shaft, digging a substantially vertical raise which communicates with the cross-cut, constructing a sub-level that communicates with said raise at one point, and constructing a second similar sub-level at a different elevation from the first sub-level and out of alinement with the first named sub-level, thus relieving the portion of the ore adjacent to the sub-levels from too great a strain.

2. The herein described steps in a process of mining soft ore which consists in sinking a shaft in the vein of ore, extending a cross-cut from the bottom of the shaft, digging a substantially vertical raise which communicates with the cross-cut, constructing a sub-level that communicates with said raise at one point constructing a second similar sub-level at a different elevation from the first sub-level and out of alinement with the first named sub-level, thus relieving one portion of the ore from too great a strain, and digging sub-raises connecting the sub-level in one plane with the sub-level in another plane.

3. The herein described steps in the process of mining soft ore which consists in sinking a shaft, extending a cross-cut from the bottom of the shaft into a vein of ore, digging a substantially vertical raise which communicates with the cross-cut and inclining the lower end of the raise just before it opens into the cross-cut, constructing a sub-level that connects with said raise at one point, constructing another similar sub-level at a different elevation from the first named sub-level, and digging sub-raises connecting the sub-level in one plane with the sub-level in another plane.

4. The herein described steps in the process of mining soft ore which consists in sinking a shaft, extending a cross-cut from the bottom of the shaft into a vein of ore, digging a substantially vertical raise which communicates with the cross-cut and inclining the lower end of the raise just before it opens into the cross-cut, constructing a sub-level that connects with said raise at one point, and constructing another similar sub-level at a different elevation from the first named sub-level, digging sub-raises connecting the sub-level in one plane with the sub-level in another plane, depositing ore from one sub-level in the downwardly leading sub-raises, receiving the ore in a car in an adjacent lower sub-level emptying the contents of the car down the main raise and subsequently filling the sub-raise with ore to prevent the caving in of the walls.

5. The herein described process of mining soft ore which consists in sinking a shaft in the vein of the ore, extending a cross-cut from the bottom of the shaft, digging a substantially vertical raise which communicates with the cross-cut, constructing a sub-level that communicates with said raise at one point, constructing a second similar sub-level at a different level from said first sub-level, and out of alignment with the first named sub-level, and digging a series of sub-drifts from each of said sub-levels, the drifts communicating with one of said sub-levels being disposed out of alignment with the drifts communicating with the other sub-level.

SAMUEL JOHN GOODNEY.